

ROUND #1

*Gainesville State College
Mathematics Tournament
April 14, 2007*

A man has \$0.90 in quarters, nickels and dimes.

Half the coins are nickels and a fourth of them are dimes.

How many of each does he have?



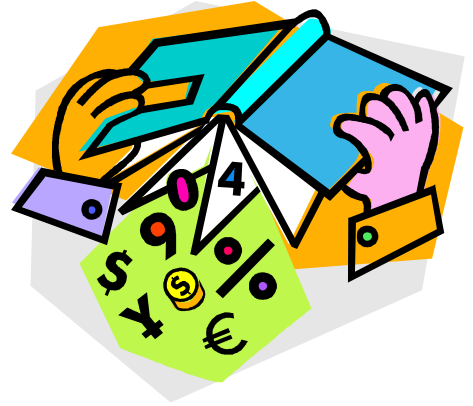
ROUND #2

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Four different integers w, x, y, z satisfy the equation

$$(7-w)(7-x)(7-y)(7-z)=4.$$

What is the value of $w+x+y+z$?

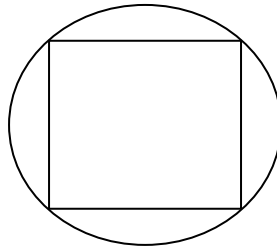


ROUND #3

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The area of a circle is 12.5π square units.

What is the perimeter of the square it circumscribes?



ROUND #4

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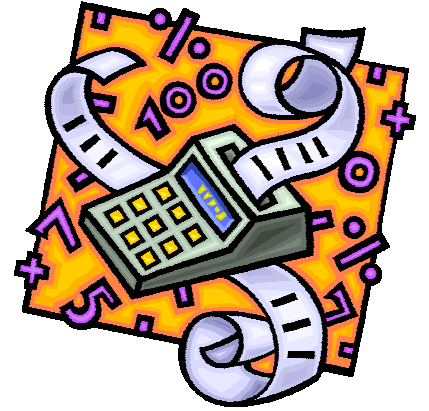
A regular polygon has 44 diagonals. (A diagonal is a line segment connecting two nonadjacent vertices of a polygon.)

How many sides does the polygon have?

ROUND #5

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Notice the consecutive squares $13^2 = 169$ and $14^2 = 196$ have the same digits but the last two digits are transposed. Find consecutive squares that have the same digits but the last three are 964 and a permutation of 964.



ROUND #6

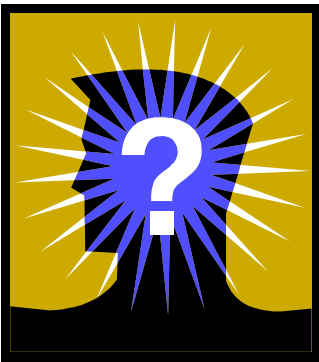
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If $\arctan x + \arctan b = 45^\circ$, express x in terms of b without using trigonometric functions.

ROUND #7

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If $f\left(\frac{1}{x+3}\right) = \frac{1}{2-5x}$ for $x > 1$, then $f(x) =$

ROUND #8

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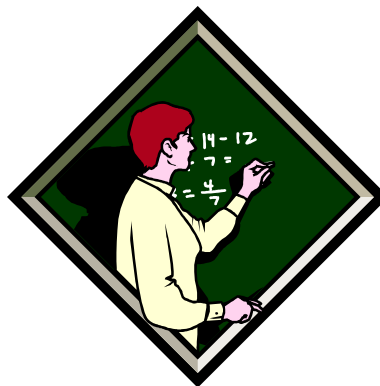
Find the value of the following sum of products:

$$1 \cdot 2 + 2 \cdot 3 + 3 \cdot 4 + 4 \cdot 5 + \dots + 98 \cdot 99 + 99 \cdot 100$$

Note: You may use a straight brute force approach or consider using the following formulas to assist you.

$$(1) \quad 1 + 2 + 3 + 4 + \dots + (n-1) + n = \frac{(n)(n+1)}{2}$$

$$(2) \quad 1^2 + 2^2 + 3^2 + 4^2 + \dots + (n-1)^2 + n^2 = \frac{(n)(n+1)(2n+1)}{6}$$

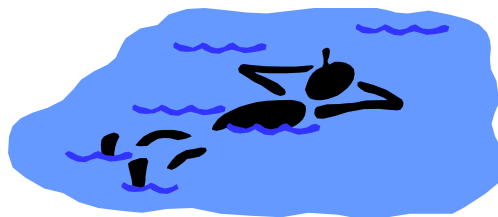


ROUND #9

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Pump A alone can fill a swimming pool in 8 hours. Pump B alone can fill the same swimming pool in 7 hours. When both pumps are turned on, the water pressure decreases for both pumps so Pump A and Pump B can only pump at 70% and 80%, respectively, of their normal speeds. How long will it take to fill the swimming pool if both pumps are turned on?

Give your answer in terms of hours and minutes (rounded to the nearest minute).



ROUND #10

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For which value of θ do the two shaded regions have the same area? Give the value in radians accurate to 3 decimal places.

